

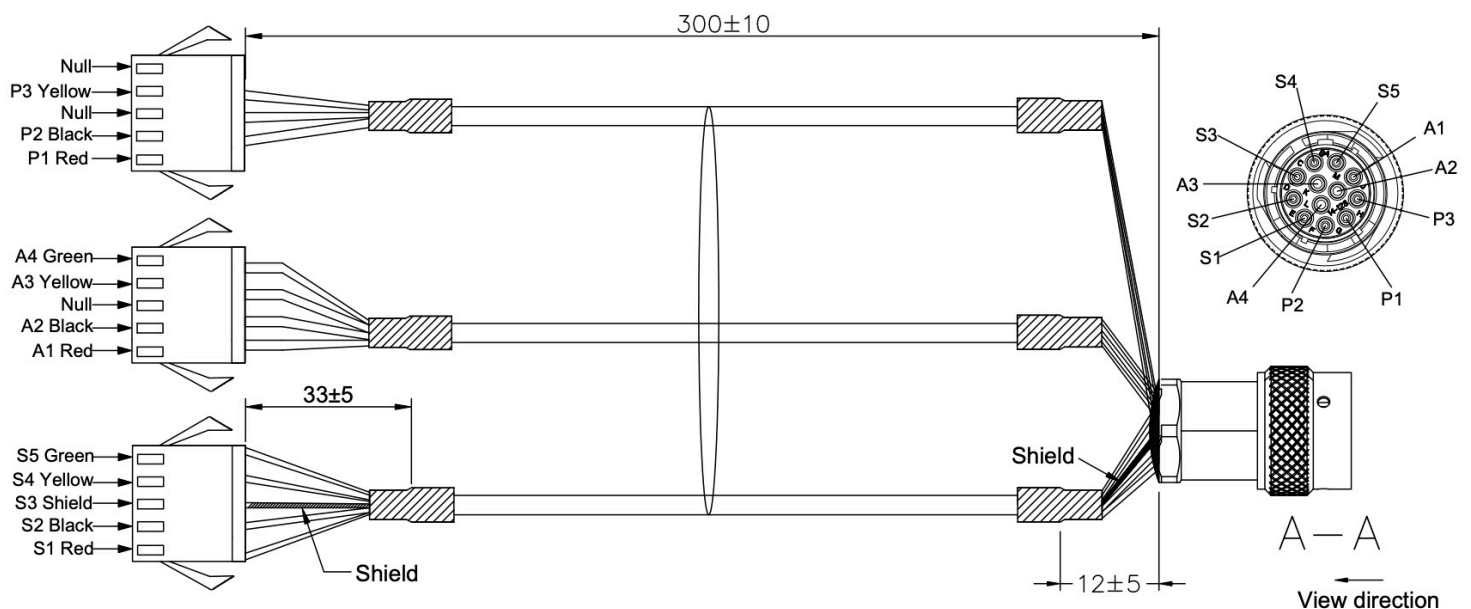
Multi-pins socket definition of pro-version battery pack

Overview

Bestgo developed pro-version battery packs which can offer on-off signal output. Battery packs can judge the running condition and send alert to outside via multi-pins socket, those are on-off state signal can be used as switches to turn on the alert of lighter, speakers, or relays and contactors. They are not only used in single pack application, but also very necessary to be used rightly in parallel configed battery systems.

Pins definition

Below is the definition of 12-pins connector with wires (offered along with pro-version battery packs), one end is for plugging into socket of battery pack, another end has 3 flat connectors, which we called as S connector, A connector and P connector.



The S connector,

The S connector included S1, S2, S3, S4, S5. This S connector is used to connect the second extra intelligent indicator if operator purchased individually, it can be located to another space for more convenient viewing of battery status. (S3 is a shield wire do not translate any signals)

The A connector,

The A connector is used for sending out the alert signal when voltage, current and temperature is abnormal. (You can review all the alert values in table at the end of this document)

The A1 (red) represent the voltage,

The A2 (black) represent the temperature,

The A4 (green) represent the current.

The A3 (Yellow) represent the COMMON.

Below alert signals of A connector act as the last defense line for protecting the equipment which cannot accept sudden shut off caused by BMS. Do NOT trying to trigger alert signals in the nominal usage condition, adjust the usage condition of battery packs to keep them in the reasonable good range for long time healthy usage.

When voltage or temperature or current became abnormal, the resistance from A1 to A3 (common), or A2 to A3 (common), or A4 to A3 (common) will be changed from infinite resistance (open circuit) to zero resistance (closed circuit). These alert value in action are earlier than BMS cut-off value, they can be used to alert operator to stop the inappropriate usage or conditions before BMS trigger cut-off protection.

The detail on-off signal act as below,

For voltage, if value is in the good range, the resistance between A1 to A3 is effectively infinite (open circuit), while when voltage is too high or too low, resistance will become zero resistance (closed circuit).

For temperature, it is the resistance between A2 to A3 will be changed accordingly,

For current, it is the resistance between A4 to A3 will be changed accordingly.

Above characteristics can be treated as switches, can be manually wired by the operator using their own components to trigger any desirable combination of lights, speakers, or relays and contactors.

For example, above 3 types of switches can be wired to both an LED and a contactor, which can then stop the motor or machine which using battery packs, or can disconnect the input of an attached battery charging source, and thereby prevent the charging source and any connected load devices from experiencing a damaging transient voltage spike. The LED light on each switch combined will also provide an indicator to determine which individual pack triggered the alert. Operator can combine the A1, A2, A4 together, to detect their resistance to A3, if resistance became zero, it means any of volt or temperature or current has problem, should stop battery system usage.

In parallel configured system, operator should combine all battery pack's A1, A2, A4 together as one node, combine all pack's A3 together as another node, then detect the "on-off" status between those two nodes to tell main circuit act accordingly (like disconnect the main circuit). Operator can even installing an upstream LED light on each A1, A2, A4 before they are combined will also provide an indicator to determine which individual pack triggered what alert.

(Here is an important knowledge in parallel configured system. If one pack has the biggest current pass and triggered the switch, it means this battery pack is the best one. Operator have to deal with the worst battery pack which offering the smallest current when in parallel config, by replace the worst battery pack or add some resistance to the best pack, to keep the current value of every battery pack is in the good range)

Those pins and wires can allow max 60V voltage and max 1.5A current pass shortly. The A1, A2, A4 to A3 can be used as individually, or can be used as bind together, in both charging and discharging conditions, act as switches as resistance change between max and zero.

The P connector,

The P1 (red) represent the temperature that in high condition needs cooling required.

The P2 (black) represent the temperature that in low condition needs heating required.

The P3 (Yellow) represent the COMMON.

The P connectors have pins defined mainly for turn on the cooling or heating facility. So battery temperature can go back to normal temperature by the help of cooling and heating facility, but not trigger the alert that generated from A2 to A3 in A connector.

Related components

The optional second indicator with wire has total length of 1.9 meters, it can be connected to extension wire to increase the wire length, then connected to the S connector of 12-pins connector.

(The optional second indicator is sold separately, which also included 3 sets of extension wires.)

The 12-pins connector with wires has each wire length of 0.3 meter.

The extension wire has wire length of 2.0 meters, they can be connected to each other to increase wire length. Operator can also cut off one end of extension wire then use their own wires to increase the wire length.

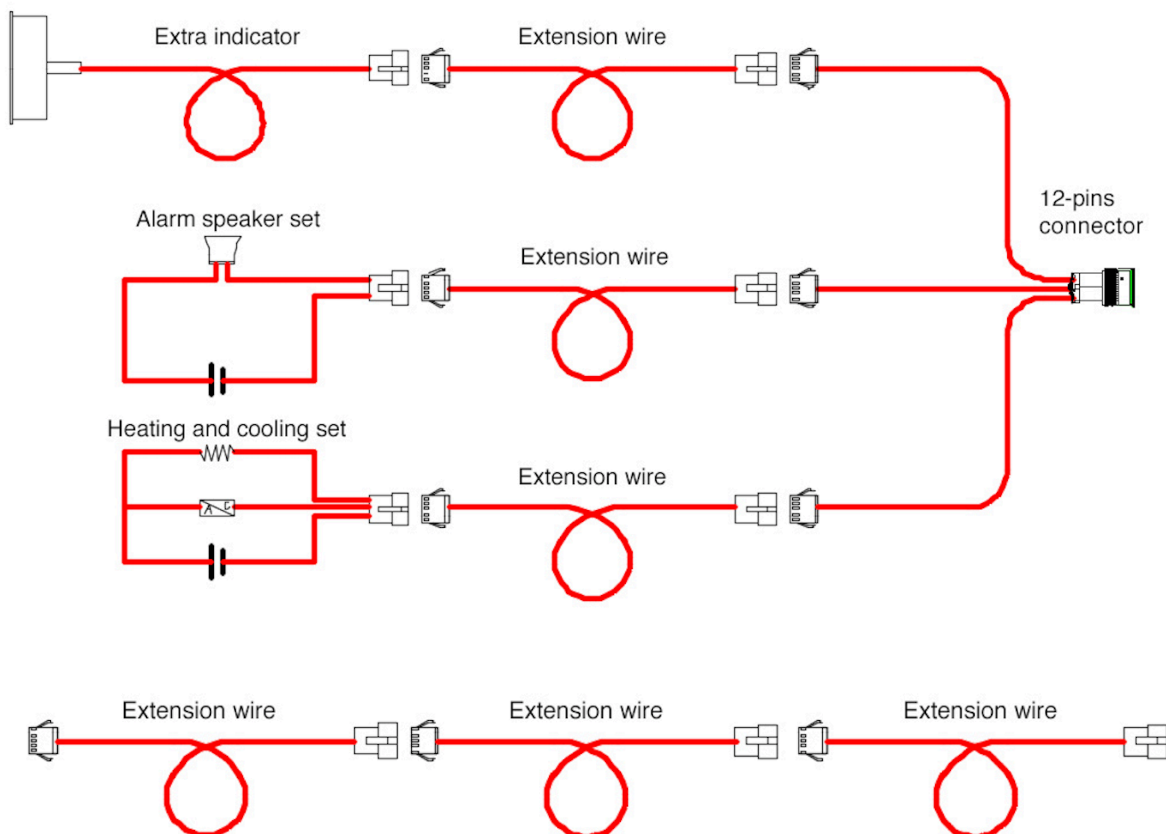
(Each pro-version battery pack contains 1 set 12-pins connector with wires, 3 sets of extension wires.)

The alarm speaker set, the heating and cooling set, should be prepared by operator himself. Here should be an independent power for that circuit, which total volt should be no more than 60V, current no more than 1.5A.

Operator can directly cut off the end of extension wire, so can have related small wires for the connection.

(The alarm speaker can be changed to the LED light etc.)

For the parallel config, please prepare reliable wires to make sure signals from A connectors are all received and well treated.



Settings for alerts in Pin definition,

For 48V100Ah LiFePO4 pro-version preferred battery pack,

| Pin to Pin | In charging state | | Action | In discharging state | | Action |
|------------|--|----------------------------------|---------------|---|-----------------------------------|---------------|
| A1 to A3 | Pack volt | $\geq 59.2 \text{ V}$ | trigger alert | Pack volt | $\leq 41.6 \text{ V}$ | trigger alert |
| | Pack volt | $\leq 58.4 \text{ V}$ | release alert | Pack volt | $\geq 48.0 \text{ V}$ | release alert |
| A2 to A3 | Temperature | $\geq 50 \text{ }^\circ\text{C}$ | trigger alert | Temperature | $\geq 65 \text{ }^\circ\text{C}$ | trigger alert |
| | Temperature | $\leq 48 \text{ }^\circ\text{C}$ | release alert | Temperature | $\leq 63 \text{ }^\circ\text{C}$ | release alert |
| | Temperature | $\leq 5 \text{ }^\circ\text{C}$ | trigger alert | Temperature | $\leq -20 \text{ }^\circ\text{C}$ | trigger alert |
| | Temperature | $\geq 7 \text{ }^\circ\text{C}$ | release alert | Temperature | $\geq -18 \text{ }^\circ\text{C}$ | release alert |
| A4 to A3 | The charging current is all the time bigger than 100A for over than 16 seconds | | trigger alert | The discharging current is all the time bigger than 120A for over than 16 seconds | | trigger alert |
| | The charging current is all the time bigger than 180A for over than 8 seconds | | trigger alert | The charging current is all the time bigger than 220A for over than 8 seconds | | trigger alert |
| P1 to P3 | Temperature | $\geq 47 \text{ }^\circ\text{C}$ | trigger close | Temperature | $\geq 55 \text{ }^\circ\text{C}$ | trigger close |
| | Temperature | $\leq 43 \text{ }^\circ\text{C}$ | release open | Temperature | $\leq 53 \text{ }^\circ\text{C}$ | release open |
| P2 to P3 | Temperature | $\leq 10 \text{ }^\circ\text{C}$ | trigger close | Temperature | $\leq -5 \text{ }^\circ\text{C}$ | trigger close |
| | Temperature | $\geq 14 \text{ }^\circ\text{C}$ | release open | Temperature | $\geq 0 \text{ }^\circ\text{C}$ | release open |

Note:

For the current alert, the pin resistance will keep as zero for 10+2.5 seconds, then circuit board will reset and make judgement again if past 16 seconds / 8 seconds has such over current happens, to decide how to act accordingly.